PROCESS FOR SEPARATING SYNTHESIS GAS INTO FUEL CELL QUALITY HYDROGEN AND SEQUESTRATION READY CARBON DIOXIDE

ABSTRACT OF THE DISCLOSURE

[0029] A method and apparatus for separating gas mixtures containing synthesis gas (syngas) into separate streams of wet hydrogen containing significantly reduced amounts of CO_2 and CO, with the CO_2 being "sequestration ready" and containing less than 1% fixed gases. In the preferred embodiment, a mixture of limestone and iron oxide circulates between two fluidized beds whereby one bed is fluidized with a gas containing syngas, while the other bed is fluidized with a gas containing steam and oxygen. As the fluidizing gas containing syngas passes through the bed, the CO_2 reacts with CaO to form $CaCO_3$. Virtually all of the CO is removed by a water gas shift reaction, forming hydrogen and CO_2, with the remainder being removed by reaction with the iron oxide, reducing Fe_2O_3 to FeO. Some hydrogen is also removed by reaction with the iron oxide, reducing Fe_2O_3 to FeO, while the remainder of the hydrogen passes through the fluid beds, leaving in a purified state, i.e., PEM fuel cell quality.